Philippines, by M. O. Beauregard. This is a lengthy treatise on the products, language, sociology, and history of the islands, based chiefly on Spanish authorities.—Report, by M. Topinard, of the excavation of the Neolithic grotto of Feigneux (Oise), in which was found a skull that had been trepanned both before and after death. These finds were specially rich, including four skulls which bore traces of having been compressed; and, considered generally, this deposit may be regarded as a pendant to that of Orrouy.—(1) On a burial ground of the Stone Age at Crécy-en-Brie; (2) on cut flints in the alluvial sand below Paris; and (3) on a prehistoric work-place at Fontenay-aux-Roses, by M. Thieullen. The writer draws attention to the frequency with which the larger debris of cut flints are found near water, and always in localities favourable to the existence of prehistoric man, while from the character of the great ossuaries, in which, as at Crécy-en-Brie, the remains of men and women of all ages, and children, are found, he believes we may assume that the men of the period lived in family rather than in tribal association.—A study of the brain of Bertillon, by MM. Chudzinski and Manouvrier. A *résumé* of the results of this carefully conducted cerebral analysis, which are here given in detail, shows generally, *inter alia*, a large development of the anterior portion of the brain in all directions; a relatively inferior development in point of size in the temporal lobes, and in the cerebellum; and great ramification in the fossæ.

THE *Izvestia* of the Russian Geographical Society (xxiii. part 5) contains, besides Dr. Bunge's preliminary report about his expedition to the New Siberia Islands, a lecture on the problems of scientific geography by Dr. Petri, who was appointed in October last Professor of Geography and Anthropology at the St. Petersburg University; a paper by M. Rovinsky on the beliefs of the Montenegrins; M. Nikolsky's sketch of fishing on Lake Aral, a valuable contribution to the knowledge of the fishes inhabiting Lake Aral, and especially the lower Amu-daria, their habits, and the modes of fishing; and notes by General Stebnitsky on recent pendulum observations, on M. Boguslavsky's work on the Volga, and on W. J. Havenga's map of Sumatra.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, February 2.—"On Tidal Currents in the Open Ocean." By J. Y. Buchanan, F.R.S.

This paper gives details of some current observations which I made in the open ocean north of the Canary Islands in October 1883 in the course of the surveying expedition preliminary to the laying of a telegraph cable between these islands and the mainland of Spain. This expedition consisted of two steamers, the *Dacia* and the *International*, belonging to the India-rubber, Gutta-percha, and Telegraph Works Company (Limited), of Silvertown. The chief scientific results gained during it were the confirmation of the view—which was suggested by the density and temperature of the bottom water observed in this part of the Atlantic during the cruise of the *Challenger*—that the overflow of warm concentrated sea-water from the Mediterranean at the bottom of the Straits of Gibraltar was the cause of the abnormally high density and temperature of the bottom water in this part of the ocean, and the preparation of a complete survey of the bed of the ocean in this district. During the progress of the work several very remarkable "oceanic shoals" were discovered and surveyed, notably the "Coral Patch" in lat. 34° 57′ N., long. 11° 57′ W., with a depth of 400 to 500 fathoms, and the "Dacia Bank," in lat. 31° 9′ N., long. 13° 34′ W., with a minimum depth of 49 fathoms. In sounding over both of these banks conclusive evidence was obtained of the existence of actual vertical precipices in some positions on their flanks; and from the very great average steepness all round, it is rendered in every way probable that, if they were laid dry, they would form mountain peaks as precipitous and inaccessible as any to be found on land. The dredging on the Coral Patch showed it to consist of deep-sea corals, principally *Lophohelia prolifera*, growing with the utmost luxuriance and attached to dead stems of the same species, already getting coated with peroxide of manganese.

For the purposes of the survey of the "Dacia Bank" a buoy was anchored on its edge, and on the afternoon of October 21 I spent some hours in a boat made fast to it, and observed the current in strength and direction. The following is a summary of the results:—

Hour p.m.	2.15	2.40	3.30	4.6
Direction (true)	N. 11° E.	N. 41° E.	N. 56° E.	N. 101° E.
Rate (knots per hour)	0·47	0·30	0·25	0·30

It will be seen from these observations that in two hours the current had shifted its direction through 90°, and had passed through a minimum velocity of 0·26 per hour without there having been any period of "slack water." The observations are too few in number to make it worth while submitting them to analysis; but a little study of them will show that they indicate a current which is the resultant of a continuous current and a periodic one. A constant current running south-east by east, combined with a tidal current running north-north-west and south-south-east, the maximum velocity of which, in either direction, is twice that of the permanent current, would give a resultant agreeing fairly with that observed.

No measurements were made of the under current, but, by sinking a tow-net made fast to a sounding-line, it was seen to be running at a depth of 75 fathoms in the same direction as the surface current and apparently with much the same velocity. In the channels between the Canary Islands, where even on the shallowest ridges there is over 1000 fathoms of water, the tidal current reaches to the very bottom, and its scouring action is shown by the nature of the bottom. To seaward, in 1800 or 2000 fathoms, the bottom is a fine Globigerina ooze, which gets coarser and sandier as the water shoals in the channels, till on the summit ridge there is generally no loose deposit at all, and the bottom is rock or coral coated with black oxide of manganese. Round the western end of Teneriffe the tide runs violently, causing rips and overfalls. Much rocky ground is met with in the North Atlantic in depths of 1300 and 1400 fathoms, especially on the ridge which appears to extend through the whole length of that ocean. It is not unlikely that the summit edge of this ridge may be swept clean through the greater part of its length, and it must be remembered that the removal of sediment from one part of the ocean bottom means its deposit in greater abundance in others, especially in hollows in the neighbourhood of the ridge. Hence a sounding in "ooze" or "mud" in one position furnishes no argument against the trustworthiness of another sounding in the vicinity and in equally deep water on "rock" or "hard ground."

It is evident, then, that the power of shoals to transform the tidal wave into tidal currents furnishes a natural agency which tends to limit the indefinite shoaling of the water by the continual deposition of loose sediment. On the other hand, these currents, in sweeping clean the rocky eminences at the bottom of the ocean, prepare a lodging-place for deep-sea corals, and assist in bringing food to them when settled, thus enabling them to build up their pillar-like banks, of which a very fine example is furnished by the "Coral Patch" above referred to. There can be little doubt that it is reducing more or less rapidly the depth of the water above it. The "Dacia Bank" and the "Seine Bank" are examples where limiting conditions, probably of temperature, appear to have been reached. The water may be too warm for the deep-sea species; and not warm enough for the tropical, *par excellence*, reef-building species.

A remarkable cluster of banks resembling those above described occurs off the Brazilian coast, between the Agulhas reef and the islands of Trinidad and Martin Vaz. Some of them are named, as the Jaseur, the Montague, and the Victoria banks; with from 25 to 30 fathoms, and completely surrounded by deep water. Further north is the dangerous Rocas, lying close to the route of steamers from North America and Europe to South American ports. Further south, again, are two suggestive soundings, one of 19 fathoms, in lat. 32° 40′ S., long. 47° 0′ W., marked "Nelson, 1859," and the other of 72 fathoms, in lat. 37° 50′ S., long. 49° 50′ W., marked "Sutlej, 1863," in the chart. Seamen are not usually mistaken as to whether they have or have not found bottom in depths such as 19 or 72 fathoms, and there is little doubt that careful search would reveal the existence of shoals in these localities. But the search must be diligent and methodical, always following the lead of the soundings as they shoal. The careful and detailed study of these oceanic shoals or embryo islands is of great importance for oceanographical science, and it would not be easy to find more interesting work for the marine surveyor.

March 1.—"On the Changes produced by Magnetization in the Dimensions of Rings and Rods of Iron and of some other Metals." By Shelford Bidwell, F.R.S.

Linnean Society, February 16.—W. Carruthers, F.R.S., President, in the chair.—Mr. Spencer Moore exhibited, and made some remarks upon, specimens illustrative of the *Palmella* state *Draparnaldia glomerata*.—Mr. D. Morris (Royal Gardens, Kew) exhibited a specimen of wood of *Hieronyma alchornioides* received from Trinidad, showing in its fissures mineral deposits, which on chemical analysis proved to be calcic carbonate. For comparison, Mr. Morris also exhibited and made some observations upon some deposits of calcic phosphate in teak. Some of these (described by Sir Fred. Abel, Quart. Journ. Chem. Soc. xv. 91), are 6 feet in length, 6 inches in breadth, and from $\frac{1}{8}$ inch to $\frac{3}{8}$ inch in thickness. Deposits in bamboo known as *tabasheer* (silicate) were shown, as also pearls (carbonate of lime) from cocoa-nuts, received from Dr. Sydney T. Hickson (see NATURE, vol. xxxvi. p. 157). All these specimens were from the Museum of Economic Botany of Kew.—Dr. Burn Murdock exhibited and offered remarks upon the intra-marginal (so-called) veins in the section *Areolata* of the genus *Erythroxylon*, of which *E. coca* is the most familiar species. These lines are due to a thickening of the parenchymatous tissue which takes place in the bud stage, and are in no way connected with the venation of the leaf.—Mr. G. F. Sherwood exhibited a collection of photographs taken in Samoa, illustrating the scenery and people, together with a number of necklets formed with strings of various bright-coloured seeds.—The first paper of the evening was read by Mr. H. N. Ridley, on self-fertilization and cleistogamy in orchids. Three common methods of self-fertilization were explained: (1) by the breaking up of the pollen mass, and falling of the dust either directly upon the stigma, or into the lips whence it comes into contact with the stigma; (2) by the falling of the pollen masses as a whole from the clinandrum into the stigma; and (3) by the falling forward of the pollinia from the clinandrum, or the anther cap, the caudicle and gland remaining attached to the column. An interesting discussion followed, in which Prof. Marshall Ward, the Rev. G. Henslow, and Mr. A. W. Bennett took part.—A paper was then read by Dr. John Rae, F.R.S., entitled "Notes on some of the Birds and Mammals of Hudson's Bay Territory." Dr. Rae, whose long residence in Northern and Arctic America enabled him to speak authoritatively from personal observation, gave an interesting account of the migration of the Canada goose, snow goose, aud blue-winged goose, and of the habits of the American hare and lemming. He particularly referred to the belief entertained by some of the Indian tribes he had met with, and to which he himself gave credence, that certain species of small birds are assisted on their migrations by being carried on the backs of the Canada geese. Mr. J. E. Harting, in criticising this paper, gave an exposition of the views held by leading ornithologists on the subject of the American Canada and snow geese, their relationship and nomenclature, and pointed out that the story of small birds being carried by larger ones is not confined to North America, but is current in South-Eastern Europe, Palestine, and Arabia, where trustworthy evidence has been obtained that wagtails and other small birds travel on the backs of cranes. He added that one instance was known to him of such an occurrence in England, a short-eared owl having been seen to arrive on the north coast of Yorkshire carrying on its back a golden-crested wren, which was secured by the observer.

Chemical Society, February 16.—Mr. W. Crookes, F.R.S., in the chair.—The following papers were read:—Chemical investigation of Wackenroder's solution, and explanation of the formation of its constituents, by Prof. Debus, F.R.S. Wackenroder's solution is obtained by passing hydrogen sulphide into an aqueous solution of sulphur dioxide until the latter is decomposed. It has been considered to contain sulphur in suspension and pentathionic acid in solution, although neither the acid nor its salts have been prepared pure, and, in consequence, Spring has denied the existence of the acid, regarding it as a solution of sulphur in tetrathionic acid. The author finds that Wackenroder's solution contains: (1) sulphur in suspension in very minute drops, (2) a new allotropic modification of sulphur, (δ), in simple solution, and in the colloidal condition, (3) traces of trithionic acid, (4) tetrathionic acid, (5) pentathionic acid, and (6) a polythionic acid containing more sulphur than the penta- acid, probably hexathionic acid. Pure potassium and copper pentathionates were prepared, and the reactions of the polythionates studied, among the most interesting of which are the spontaneous changes in aqueous solution shown by the equations—

$$(a)\ K_2S_5O_6 = K_2S_4O_6 + S;\ (b)\ 2K_2S_4O_6 = K_2S_3O_6 + K_2S_5O_6;$$
$$(c)\ 2K_2S_3O_6 = K_2S_4O_6 + K_2SO_4 + SO_2;\ (d)\ 3K_2S_3O_6 = K_2S_5O_6 + 2K_2SO_4 + 2SO_2;$$

the reactions (*a*) and (*b*) occurring in either direction with equal facility. The final products of the action of hydrogen sulphide on tetra- and penta-thionic acids are water and sulphur. The polythionic acids can also be obtained by the action of sulphur dioxide on potassium thiosulphate or on the chlorides of sulphur. The concluding portion of the paper was devoted to a discussion of the formulæ of the polythionates.—Potilizin's law of the mutual displacement of chlorine and bromine, by Prof. Thorpe, F.R.S., and Mr. J. W. Rodger. On heating bromine with an equivalent quantity of an anhydrous metallic chloride in a sealed glass tube, free from air, to the temperature of the melting-point of zinc, Potilizin found that the amount of chlorine displaced by bromine was greater the higher the atomic weight of the metal in the chloride; and further, that, if A be the atomic weight of the metal, p the percentage of chlorine displaced from its chloride when treated as above, and E its valency, the formula $\frac{A}{pE^2}$ = a constant held good in the case of fourteen chlorides. To test the validity of this law, the authors heated the chlorides of sodium, potassium, silver, strontium, barium and lead with bromine at 350°–450°, and found that, with the exception of silver chloride, in which the deviation was not so marked, the amount of chlorine displaced was considerably less than that required by Potilizin's law, and in all cases stood in no definite relation either to the duration of heating or to the atomic weight of the metal of the chloride used, although most chlorine was displaced from the chloride of highest molecular weight when several were heated simultaneously. These experiments therefore disprove the validity of Potilizin's law.—A gasometric method of determining nitrous acid, by Dr. P. F. Frankland. Based on the interaction of urea and nitrous acid.—The action of some specific micro-organisms on nitric acid, by the same. The author has investigated the behaviour, when grown in nutritive solutions containing nitrates, of a number of micro-organisms obtained from air and water, and cultivated in a state of purity. Of thirty-two different forms so examined, sixteen or seventeen, and particularly *Bacillus ramosus* and *B. pestifer*, were found to reduce the nitrate to nitrite more or less completely, whilst the remainder were quite destitute of this power. The behaviour of the organisms was not altered in this respect by excluding air from the solutions in which they were cultivated.—The action of phosphorus pentachloride on salicylaldehyde, by Mr. C. M. Stuart.—Some interactions of nitrogen chlorophosphuret, by Mr. W. Couldridge.—Action of alcohols on ethereal salts in presence of small quantities of sodic alkylate, by Prof. Purdie and Mr. W. Marshall.—Note on the densities of cerium sulphate solutions, by Dr. B. Brauner. The values of the densities of solutions of the anhydrous and of the hydrated salt are identical for solutions of equal concentration.

ERRATUM.—P. 406, second column, line 9 (from top), *for* $v = (n^2 - 1)(n^2 + 2)$ *read* $v = (n^2 - 1)/(n^2 + 2)$.

Physical Society, February 25.—Prof. Reinold, F.R.S., President, in the chair.—The following papers were read:—Note on the efficiency of incandescent lamps with direct and alternating currents, by Prof. W. E. Ayrton, F.R.S., and Prof. J. Perry, F.R.S. This relates to the question whether the "efficiency" (candles per watt) is greater or less for alternating than for direct currents. Experiments made by Messrs. Shepherd and Wheatley, two of the students at the Central Institution (to whom the authors express their thanks for the valuable assistance rendered) show that no appreciable difference can be detected when the lamp is at the same candle-power. In performing the experiments, three-way switches in connection with Gramme and Ferranti machines were arranged so that the current through the lamp could be quickly changed from direct to alternating, or *vice versâ*, adjustable resistances having been previously placed in the two circuits to give equal readings on a Cardew voltmeter placed as a shunt to the lamp. The currents were measured by a reflecting dynamometer wound with fine wire in order to make the error, due to unequal current density over the section, negligible. The problem has also been investigated from theoretical considerations, but the results as yet deduced would not lead the authors to anticipate the equal efficiency found experimentally. An interesting discussion followed, in which Mr. Swinburne, Prof. S. P. Thompson, Mr. Boys, and the authors took part.—Observations of the height, length, and velocity of ocean waves, by the Hon. Ralph Abercomby. Several sets of observations were made by the author in the South Pacific in 1885. The heights were measured by a sensitive ameroid, and the length and velocity by a chronograph, assuming the length and speed of the vessel to be known. The largest waves observed in a heavy sea gave a height of 46 feet, length 765 feet, velocity 47 miles per hour, and time period of 16·5 secs. Great discrepancies exist between the results of different observers, which the author believes to be chiefly due to the comparative rarity of well-defined simple waves. Replying to a question from Mr. Baily, the author said the effect on the barometer of the difference of wind pressure on the two sides of a wave was negligible.—On the temperature at which nickel begins suddenly to lose its magnetic properties, by Mr. Herbert Tomlinson. Different authorities give different values, ranging from about 300° to 400° C. In investigating the subject the author found that the said temperature depends on the magnetizing force used; *e.g.* with magnetizing forces of 5, 99, and 182 units, the temperatures at which the permeability attained its maxima were 287° C., 248° C., and 242° C., and those corresponding to permeability = 0 were 333°, 392°, and 412° respectively. From the above results it will be seen that for small magnetizing forces the change of permeability from maximum to 0 is much more sudden than for the greater forces. As in iron, the permeability decreases as the magnetizing force increases. An experiment was shown in which a nickel plated brass wire was heated to dull redness whilst suspended between the poles of an electro-magnet, and allowed to cool. When the critical temperature was attained, the wire was suddenly attracted to one or other of the poles. In reply to Mr. Shelford Bidwell, the author stated that the changes in permeability due to ordinary atmospheric changes of temperature were considerable, when small magnetizing forces were used.—Experiments on electrolysis, by Mr. W. W. Haldane Gee, Mr. H. Holden, and Mr. C. H. Lees. Whilst studying some electrolytic polarization phenomena with palladium electrodes in dilute sulphuric acid (pure), a dense liquid was seen *after reversing the current* to flow downwards in streaks from the anode. The paper is devoted to the investigation of the character of the liquid streaks, and the authors conclude that the streaks are of concentrated sulphuric acid, formed by the union of the hydrogen (occluded by the electrode whilst serving as cathode) with the SO_4 liberated at the same electrode when the current is reversed. Similar streaks were found with phosphoric acid, &c. In their next paper the authors hope to describe some experiments in which these and similar effects become of great importance in changing the resistances of electrolytes.

Zoological Society, February 21.—Prof. W. H. Flower, F.R.S., President, in the chair.—Mr. A. Thomson exhibited a series of insects reared in the insect-house in the Society's Gardens during the past year, and read a report on the subject.—Prof. G. B. Howes read a note on the azygos veins of the Anurous Amphibia. The author described an individual specimen of *Rana temporaria*, in which the azygos vein (prerenal portion of the posterior cardinal) had been retained on one side, its relations differing in important details from that observed by Hochstetter in *Bombinator*. By way of supplementing that author's work, he had examined examples of a few genera not dealt with by Hochstetter. He recorded the presence of these veins in the only specimen of *Discoglossus* dissected, and in one of five individuals of *Alytes obstetricans*—facts which lent additional support to the views of Cope and Boulenger of the lowly affinities of the Discoglossidæ. He had failed to detect these vessels in the *Aglossa*; while he regarded their total absence in *Pelobates* and *Pelodytes* as fresh evidence of the Pelobatoid rather than the Discoglossid affinities of the last-named genus.—Mr. A. Smith-Woodward read the second part of his palæontological contributions to Selachian morphology.—Mr. Oldfield Thomas gave an account of the mammals obtained by Mr. G. F. Gaumer on Cozumel and Ruatan Islands, Gulf of Honduras.—A second paper by Mr. Thomas contained the description of a new and interesting annectent genus of Muridæ, based on a specimen which had been in the Paris Museum for some years. This was supplemented with remarks on the relation of the Old and New World members of the family.—Dr. G. H. Fowler exhibited and made some remarks on a new *Pennatula* from the Bahamas, the most interesting feature of which was the presence of immature antozooids at the dorsal end of the leaves, devoid of tentacles, but possessing a well-marked syphonoglyphe on the stomatidæum which disappears with the increasing age of the polyp. The species was proposed to be named *Pennatula bellissima*.

Royal Meteorological Society, February 15.—Dr. W. Marcet, F.R.S., President, in the chair.—The following papers were read:—Electrical and meteorological observations on the Peak of Teneriffe, by the Hon. Ralph Abercromby. The author made a trip to the Island of Teneriffe in October 1887, for the purpose of making some electrical and meteorological observations, and now gives some of the results which he obtained, which may be summarized as follows:—The electrical condition of the Peak of Teneriffe was found to be the same as in every other part of the world. The potential was moderately positive, from 100 to 150 volts, at 5 feet 5 inches from the ground, even at considerable altitudes; but the tension rose to 549 volts on the summit of the Peak, 12,200 feet, and to 247 volts on the top of the rock of Gayga, 7100 feet. A large number of halos were seen associated with local showers and cloud masses. The necessary ice-dust appeared to be formed by rising currents. The shadow of the Peak was seen projected against the sky at sunset. The idea of a south-west current flowing directly over the north-east Trade was found to be erroneous. There was always a regular vertical succession of air currents in intermediate directions at different levels from the surface upwards, so that the air was always circulating on a complicated screw system.—Rainfall of South Africa, 1842–1886, by Mr. W. B. Tripp. The author gives the rainfall statistics from all those stations situated in South Africa which possess records of ten complete years and upwards. He remarks upon the chronological succession of wet and dry years, and the consecutive years above and below the mean; and also describes the seasonal distribution of monthly maxima, and the extent over which monthly rains prevail. He concludes by comparing the curves of rainfall with those of sunspot energy.—Some methods of cloud measurements, by Mr. Nils Ekholm. As exact cloud measurements afford almost the only easily available means of determining motions in the upper regions of the atmosphere, the author describes some methods which seem to him likely to give the best results. He also details the plans adopted at the Swedish Polar Station, Cap Thorsden, in Spitzbergen, and at the Upsala Observatory, for determining the direction and angular velocity of the clouds, and for making direct measurements of the height and absolute motions of the clouds.

EDINBURGH.

Royal Society, January 30.—The Rev. Prof. Flint, D.D., Vice-President, in the chair.—Prof. Nicholson read a paper on the causes of movements in general prices.—Prof. J. B. Haycraft and Dr. E. W. Carlier gave a demonstration of a method by which human blood may be withdrawn from the body and its fluidity preserved. Castor-oil is the medium in which the blood is suspended. The finger from which the blood is obtained is greased and plunged in the oil before the puncture is made, every precaution being taken to prevent contact of the blood with the air or with solid matter. In this way the blood may be preserved in a fluid state for a considerable time. As the drops of blood settle slowly in the oil, the corpuscles are seen to fall to the lower part of the drops, while the clear plasma remains above. Prof. Haycraft and Dr. Carlier believe that the human blood plasma has never before been demonstrated in an unaltered condition except in microscopic quantity. Coagulation eventually occurs, because the blood necessarily comes in contact with the sides of the wound made in the finger.—Mr. D. B. Dott read a paper, written by himself in conjunction with Dr. Ralph Stockman, describing experiments which show that the ordinarily accepted formula of morphine is the correct one.—Mr. Robert Kidston read the first part of a paper on the fossil flora of the Staffordshire coal-fields, and also read a note on *Neuropteris plicata*, Sternb., and *Neuropteris rectinervis*, Kidston.—Mr. John Aitken communicated a note on a monochromatic rainbow seen at sunset.—Prof. Haycraft read a note on a "scratching centre" found in the spinal chord of some vertebrates.—Prof. Tait communicated an answer to Prof. Boltzman's strictures, which appeared in the *Sitzungsberichte* of the Vienna Academy, on his investigations on the kinetic theory of gases. This has been sent to the *Philosophical Magazine*.

PARIS.

Academy of Sciences, February 27.—M. Janssen in the chair.—On the doctrine of the probability of error; the law of Gauss, by M. J. Bertrand. It is shown that the law of Gauss, based on the postulate, "The mean of the results of any number of measurements is the most probable value deducible from those measurements," is incapable of rigorous demonstration.—Artificial production of rhombohedric crystals of rubies, by MM. E. Fremy and A. Verneuil. Specimens were shown of these crystals produced by the method described at the meeting of March 14, 1887. These are very different from the rubies obtained by the authors in 1877, which were produced in a vitreous vein from which they were detached with great difficulty. The present gems are on the contrary produced in a porous and friable vein, where they occur in clusters of crystals in a state of great purity, and from which they may be easily removed. To effect this it suffices to throw the product of calcination into a flask of water and shake it violently. Then the vein being light remains in suspension in the water, while the heavier rubies are at once precipitated to the bottom. The gems are always rhombohedric, and in every respect comparable to the natural stones. They have the same colour and hardness, easily scratch topaz, become black when heated, regaining their beautiful pink tint when cooled, have a diamond-like brilliance, and perfectly regular crystalline form. The paper was followed by some remarks by M. Des Cloiseaux, to whom the specimens had been submitted for a thorough crystallographic examination.—On some general conditions under which nitrogen is fixed by vegetable soil, by M. Berthelot. The author had already established by a long series of experiments that certain argillaceous earths and certain sands have the property of fixing atmospheric nitrogen and enriching themselves by a slow and progressive process with organic nitrous substances obtained directly or indirectly from living organisms. Since then he has prosecuted the study of this interesting phenomenon, and here resumes the results of his further researches. Some experiments are also described on the transformation of the nitrates in the soil into nitrous combinations of organic character. His observations tend to the general conclusion that the earth should not be regarded as an inert mineral body, stable and invariable in its composition until disturbed by the process of vegetation, but as a body filled with living beings, and whose chemical composition and abundance of nitrogen vary and oscillate with the conditions determining the vitality of those beings.—On a method of quantitative analysis of chloroform, and on the solubility of this body in water, by MM. G. Chancel and F. Parmentier. Priority of discovery is claimed by the authors for this process, which, in a recent communication to the Academy, M. L. de Saint-Martin describes as new.—The Neolithic epoch at Champigny, by M. Emile Rivière. The results are described of the researches that have been carried on since 1867, by MM. Le Roy des Closages, Carbonnier, and the author, at the Neolithic station near the village of Champigny in the Department of the Seine. Here have been found numerous flint implements, scrapers, arrow-heads, polished hatchets, knives, besides four grind-stones and much coarse pottery curiously ornamented, all in association with the bones of the horse, pig, deer, roebuck, and ox. The material of some of the implements points at long migrations, or else a widespread intercourse with more or less remote tribes, the rocks used in their fabrication occurring in the region stretching from Belgium to Chiavenna in the Italian Alps.—Elements and ephemeris of the planet 272, by M. Charlois. These elements are the result of three observations made at the Observatory of Nice on February 4, 11, and 18.—Permanent deformation and thermodynamics (continued), by M. Marcel Brillouin. The chief feature of the present study is the determination of the consequences of the axiom of Clausius.—Experimental researches on the variations produced by a shock in the magnetic condition of a steel bar, by M. G. Berson. It is shown generally that the shocks or impacts given to steel bars have the effect of facilitating the disposition of the molecules in a given direction under the action of the stimulating forces, by diminishing for a very brief interval the molecular friction known as coercing force.—On the laws of chemical equilibrium, by M. H. Le Chatelier. This is a reply to a recent communication from M. Duhem claiming priority in connection with a law of thermo-chemistry lately enounced by the author.—Action of aniline on epichlorhydrine, by M. Ad. Fauconnier. Continuing the researches of M. Hörmann, the author has succeeded in obtaining one of that chemist's anticipated bases, which results from the combination of two molecules of aniline with one of epichlorhydrine. The mode of preparation and properties of this body are described.—On the respiration of corn yeast at various temperatures, by MM. Gréhant and Quinquaud. Continuing the classical studies of MM. Pasteur and Schützenberger, the authors have carried out a series of experiments to measure the volume of oxygen absorbed and of carbonic acid produced by yeast living at first in distilled water in the absence of sugar and in contact with a determined volume of air. They find that the relation $\frac{CO_2}{O}$ is variable with the temperature, so that the isolated yeast-cells would appear to behave differently from the fungi and tissues lacking chlorophyll, which give a constant relation $\frac{CO_2}{O}$ under all temperatures for the same individuals of the same species.

Astronomical Society, February 1.—M. Flammarion, President, in the chair.—M. Flammarion expressed his admiration of what he had seen at the Nice Observatory on a recent visit. In the great equatorial (30 inches aperture), the Orion nebula is splendid, stars of the sixteenth magnitude seem bright, and double stars from $0''\cdot1$ to $0''\cdot3$ apart are discovered.—M. Flammarion observed the lunar eclipse on January 28 at Nice. The moon remained easily visible during totality, and of a bright copper hue. The Nice Observatory is 375 metres above the level of the Mediterranean Sea. In the finder of the great equatorial the shadow was fringed with a transparent border about $2'$ in breadth. MM. Henry Brothers and M. Trouvelot remarked the contrast this eclipse presented with that of October 1884, in which the moon nearly disappeared. M. Detaille said that he had been struck by the very fine colour of the moon; the earth's shadow, though ill-defined on the edge, was quite circular.—MM. Henry showed a photograph of the Pleiades taken with their 34-centimetre object-glass, and an exposure of four hours. The negative included stars down to the seventeenth magnitude. Much new nebulous matter is discovered in this photograph. One of the bright stars is enveloped in a dense nebula hitherto unseen. Several singular long thin streaks of nebulous matter extend in some cases from star to star to a considerable length.—M. Berteaux, geographical editor, presented the Society with a new map of the moon by M. C. Gaudibert, the well-known selenographer. This map has been made from M. Gaudibert's observations and revisals; it has been drawn by M. Tenet, and reproduced by heliography. The diameter of the disk is 64 centimetres.

BERLIN.

Physical Society, February 3.—Prof. von Helmholtz, President, in the chair.—Prof. Paul du Bois Reymond spoke on the difficulty of forming any conception of force acting across an intervening space. From among the various instances of such forces the speaker selected gravity for a thorough discussion. He explained the six properties characteristic of this force, pointing out that only two of them—viz. the proportionality to the mass, and the law of inverse squares of the distances—can be proved experimentally, while some of its other properties, as, for instance, the independence of gravity from the condition of motion of the mass, are much doubted by many observers. Prof. du Bois Reymond then discussed the ever-recurring endeavours in past times to arrive at some mechanical construction for gravity, endeavours which were in all cases unsatisfactory, since they were always dependent either on the fundamental properties of matter, which are themselves incomprehensible, or upon physical phenomena whose basis was still undetermined. Just as in the case of many problems the experiments for whose solution have been repeated until their inaccuracy was clearly proved, so also in the case of gravity has a mechanical conception been repeatedly sought for: hence it becomes necessary to show that gravity is beyond our comprehension, and the speaker proceeded to do this by showing that Lesage's theory of the impact action of the atoms of ether, which has been so long and persistently believed, while it explains the law of inverse squares does not explain the proportionality to the mass, and in certain special cases leads to perfectly impossible results. Gravity is therefore incomprehensible, and Newton's view that it is something inherently present in all matter is correct, since it is by means of this force alone that matter is made evident to us; indeed, as far as the matter itself is concerned, it may be entirely left out of account.—Prof. Helmholtz then explained how he is in the habit of treating the subject of gravity in his lectures. He represents it as being that law of Nature, established by experience, that every body when in the neighbourhood of another body is subject to an acceleration which is proportional to its mass, and diminishes in the ratio of the inverse square of the distance between them. Such a law of Nature as this, established as it is on the basis of experience, is on the whole not unsatisfactory.—The same speaker then briefly communicated the results of two researches which he had brought before the Academy of Sciences on the previous day. Of these one is due to Prof Kundt, and has reference to the refractive power of metals. He has succeeded in constructing transparent prisms of metals, and thus determining their refractive index. The other, due to Prof. Hertz, has for its subject the rate of propagation of electro-dynamic action. By an extremely ingenious method, which the speaker explained, and which has been used by Prof. Hertz, in many of his previous researches, for the measurement of electrical vibrations, he has succeeded in proving that electricity is propagated along a metallic wire at the rate of 200,000 kilometres per second, and that electro-dynamic action passes through dielectrics with the velocity of light. These experiments thus provide the experimental confirmation of the Faraday-Maxwell theory of electro-dynamic action.

Meteorological Society, February 7.—Dr. Vettin, President, in the chair.—Lieut. Gross gave an account of a balloon voyage which he made on January 21, and described, while presenting the curves he had obtained, his meteorological observations made during this voyage with wet and dry bulb thermometers. One point of great interest which he described was that the balloon remained constantly at the upper surface of the layer of clouds which it was traversing, so that while the body of the balloon was above the clouds the car was completely immersed in the latter, notwithstanding that ballast was frequently thrown out.—Dr. Hellmann produced the curves of temperature for Northern Italy for the month of January, which showed that the cold in this region had been much more intense than in Berlin: the minimum temperature at Alessandria was – 16·5° C.—Prof. Schwalbe spoke on the subject of earthquakes in their relationship to meteorological and cosmic phenomena. He proved, on the basis of a study of the literature of this subject extending over many years, that all sorts of meteorological phenomena, such as temperature, atmospheric pressure, wind, moisture, rain, dryness, atmospheric electricity, clouds, and even optical phenomena, have been referred to earthquakes, either as accompaniments or the outcome or the cause of the same. If the statistics of earthquakes are alone considered, or more especially if microseismic observations are taken into account, the above relationship admits of being readily established; but it breaks down completely if it is worked out in a really scientific way throughout the whole of any one or a series of years. The same remark holds good with respect of those cosmic relationships which have been supposed to exist by various writers, such as that the attraction of the moon and the sun is a cause of earthquakes; this view has recently been held by Falb, and although it is in complete antagonism to the results of careful scientific investigation it has nevertheless been largely accepted by laymen. Just as the whole of Falb's views admit readily of being disproved, so also do his prognostications of earthquakes. According to Falb, each lunar quarter-day may be considered to be essentially connected with the occurrence of an earthquake which may take place either five days sooner or three days later than this time; but, notwithstanding the concession of these wide limits as to time, it has not been found that these periods are always accompanied by an earthquake.

Stockholm.

Royal Academy of Sciences, February 8.—Baron A. E. Nordenskiöld gave an account of a work he is now editing, entitled "Atlas, containing maps (copies) printed during the fifteenth and sixteenth centuries."—On the Aralo-Caspian Sea and the glaciation of the North of Europe, by Dr. H. Sjögren.—On the compression of the crust of the earth under the atmospheric pressure, by the same.—On the method used in computations concerning a certain Life Assurance Company, by Prof. Mittag-Leffler.—On the probability of divergence occurring in employing the hitherto usual methods to represent planetary pertubations analytically, by Prof. Gyldén.—On the Bacteria of the swine-plague, by Dr. E. Selander.—On the structure of Champia and Lomentaria, by Prof. Agardh.—On a series, by Dr. Lindman.—Contributions to the knowledge of the reactions of the plato-oxalate, by Dr. Söderbaum.—On the action of chloron on α- and β-naphthol, by Prof. Cleve.—On two β-amido-naphthalin-sulphon acids, by G. Forsling.—On the action of the metaphosphoric acid on di- and tri-oxides, by K. J. Johansson.—Contributions to the knowledge of carbo-hydrates; No. 2, on graminine, by Drs. Ekstrand and Johansson.—Contributions to the theory of the undulatory movement in a gaseous medium (continuation), by Prof. Bäcklund.—On the rhombic porphyry from the valley of Brumun in Norway, by H. Bäckström.—The form of the crystals, and the optical constants of hydro-carbostyrile, by the same.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

Hand-book of Perspective: H. A. James (Chapman and Hall).—Elementary Hydrostatics: S. B. Mukerjee (Thacker).—Chambers's Encyclopædia, New Edition, vol. i. (Chambers).—The Flora of West Yorkshire: F. A. Lees (Reeve).—The Fisheries and Fishery Industries of the United States; Section 2, Geographical Review: G. B. Goode (Washington).—The Religious Sentiments of the Human Mind: D. G. Thompson (Longmans).—Incwadi Yami: J. W. Matthews (Low).—History of Portugal; E. McMurdo (Low).—Geometry in Space: edited by R. C. J. Nixon (Clarendon Press).—The World to Come: J. W. Reynolds (K. Paul).—Flora of the Hawaiian Islands: W. Hildebrand (Williams and Norgate).—Facts about Ireland: A. B. MacDowall (Stanford).—Everybody's Pocket Cyclopædia (Saxon).—On Cold as a Cause of Disease: W. H. Ransom (Williams and Norgate).—Bulletin de l'Académie Royale des Sciences de Belgique, No. 12 (Bruxelles). Geological Magazine, March (Trübner).—Catalog der Conchylien-Sammlung, Sechste Lieferung (Paetel, Berlin).—Memoirs of the Boston Society of Natural History, vol. iv. Nos. 1 to 4 (Boston).—La Première Comète périodique de Tempel, 1867, ii. (Genève).

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